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Liko phonology and grammar : a Bantu language of the Democratic Republic of the Congo

Wit, G. de

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Author: Wit, Gerrit de

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2 Phonological Structure

2.1 Introduction

This chapter describes the phonological structure of the Liko language, its consonant and vowel systems, syllable structure and word structure. Syllable structure will be presented after the interpretation of surface glides and sequences of two identical vowels.

The inventory of Liko consonants comprises the places and manners of articulation common in Bantu languages and includes prenasalized plosives and fricatives, implosives and plosives with double articulation. The consonants are presented and contrasted, with remarks about their distribution in roots. An analysis of complex consonants is given after the contrasts.

I will describe syllable structure after consonants and vowels, because it depends on the analysis of sequences of identical vowels in the section on vowels. Syllable structures within roots in Liko are: CV, V and CGV, where CV and V are the most common. The presentation of these structures is followed by the analysis of the phonetic nature of "G" in CGV structures. A description of glides and an account of the changes imposed on loanwords are given at the end of the section on syllable structure.

The structure of words in terms of sequences of syllables is presented in the section on Word Structure, for nouns and verbs separately. Liko has few consonant constraints as far as the position in the word is concerned. As for vowel constraints, there are a number of restrictions on the co-occurrence of vowels within -CVCV noun stems. Only five of the nine vowels in Liko are frequently found in verb roots, namely the four high vowels /ɪ, i, u, u/ and the low vowel /a/.

Liko has a nine-vowel system with ATR (Advanced Tongue Root) harmony. There are four high and four mid vowels contrastively; the low vowel /a/ occurs in roots with high and mid vowels. The vowels are presented and contrasted, along with

comments about their distribution. Vowel harmony changes caused by ATR are explained where they occur in the data in this chapter. Liko has [+ATR] roots as well as [+ATR] dominant suffixes (including one verbal extension). I refer the reader to Chapter 3 "Phonological Processes" for a description of ATR harmony in the language.

Liko is a tone language with two underlyingly contrastive tones, High and Low. Low and High can be combined on a short syllable. The syllable is the tone-bearing unit (TBU) in the language. In situations in which there are two tones and only one TBU available, a sequence of Low and High are associated together to form a surface LH tone on a monosyllable, if Low or High does not merge with an adjacent identical tone. A TBU can thus have a H or a L tone, or a combined LowHigh. A HL tone on a TBU is not permitted. Sequences of High and Low where one TBU is available result in association of High or Low with an adjacent identical tone, or in non-automatic downstep caused by a delinked L tone. Because of its important role in the language, a separate chapter is devoted to tone (Chapter 4).

2.2 Consonants

2.2.1 Inventory of consonants

The consonants of the Liko consonant system are presented in the following charts. They both represent the inventory of contrastive consonants in the language, the first one in the IPA⁴⁹, the second one in the consonant symbols used in this book. Contrastive consonants are written between forward slashes. In the text, phonetic representations use IPA symbols in square brackets.

⁴⁹ I have used the version of the International Phonetic Alphabet that was revised in 2005. <http://www.langsci.ucl.ac.uk/ipa/>, April 28, 2011.

Table 2 Liko consonant chart in IPA

		Labial	Alveolar	Palatal	Velar	Glottal	Labial-Velar
implosive		ɓ	ɗ				
plosive	voiceless	p	t		k		kp
	voiced	b	d		g		gb
	prenasalized	^m b	ⁿ d		^ŋ g		^{ŋm} gb
fricative	voiceless	f	s			h	
	voiced	v	z				
	prenasalized	^m v	ⁿ z				
nasal sonorant		m	n	ɲ			
oral sonorant			l	j			w

Prenasalized plosives and fricatives are underlyingly contrastive consonants in Liko. Interestingly, in some labial-velar plosives, the labial part is realized as a bilabial trill (see 2.2.4).

Table 3 Liko consonant chart with the consonant symbols used in this book

		Labial	Alveolar	Palatal	Velar	Glottal	Labial-Velar
implosive		ɓ	ɗ				
plosive	voiceless	p	t		k		kp
	voiced	b	d		g		gb
	prenasalized	mb	nd		ng		ngb
fricative	voiceless	f	s			h	
	voiced	v	z				
	prenasalized	nv	nz				
nasal sonorant		m	n	ny			
oral sonorant			l	y			w

The phonetic description of the contrastive consonants in Table 2 is:

Ingressive pharynx air sounds

[ɓ] voiced bilabial plosive with ingressive pharynx air

[ɗ] voiced alveolar plosive with ingressive pharynx air

Plosives

- [p] voiceless unaspirated bilabial plosive⁵⁰
- [b] voiced bilabial plosive
- [t] voiceless unaspirated alveolar plosive
- [d] voiced alveolar plosive
- [k] voiceless unaspirated velar plosive
- [g] voiced velar plosive
- [k̠] voiceless unaspirated labial-velar plosive
- [g̠] voiced labial-velar plosive

Fricatives

- [f] voiceless labio-dental fricative
- [v] voiced labio-dental fricative
- [h] voiceless glottal fricative
- [s] voiceless alveolar grooved fricative
- [z] voiced alveolar grooved fricative

The apical part of the tongue makes contact for both [s] and [z].

Prenasalized consonants

- [^mb] prenasalized voiced bilabial plosive
- [ⁿd] prenasalized voiced alveolar plosive
- [^ŋg] prenasalized voiced velar plosive
- [^{ŋ^m}g̠] prenasalized voiced labial-velar plosive
- [^mv] prenasalized voiced labio-dental fricative
- [ⁿz] prenasalized voiced alveolar grooved fricative

Nasal sonorants

- [m] voiced bilabial nasal
- [n] voiced alveolar nasal
- [ɲ] voiced palatal nasal

⁵⁰ 'With egressive lung air', unless indicated otherwise.

Oral sonorants

[l] voiced alveolar lateral approximant

[j] voiced palatal approximant

[w] voiced labial-velar approximant

2.2.2 Consonantal contrasts

This section gives examples that show evidence of the contrastiveness of each of the consonants in Table 2. Whenever possible, I have given monomorphemic examples for contrasts in root-initial position in order to avoid variation at morpheme boundaries. This means that these contrasts are often exemplified by singular or plural nouns from classes with no noun-class prefix. In case there is no such noun in my data to show a contrast in the root-initial position, I have used a noun with a noun-class prefix or occasionally a singular Imperative form. Although these Imperative forms are not monomorphemic, because the verb root is followed by the final vowel **-a**, the initial consonant of the verbal base is not preceded by a subject prefix. Words that are, by my knowledge, loanwords, compounds and derived forms are avoided or marked as such.

The presentation of the consonantal contrasts is structured as follows: firstly, the contrasts are given for consonants sharing the same place of articulation, but differing in the manner of articulation, moving from labial to glottal and finishing with labial-velar; secondly, the consonants having the same manner of articulation are contrasted for place of articulation.

A few consonants in the Liko system have distributional constraints with respect to the position in a root (see 2.5.3). Other occurrence constraints are noted in the text.

a. Same place of articulation**Labial consonants**

Labial plosives and the labial nasal consonants occur in all positions in the root, whereas labial fricatives have some restrictions. The examples below are given in four sets. The first two sets show labial consonants in root-initial position preceding low and high vowels respectively. The second two sets have labial consonants as the onset of the final syllable of the root in frames of low and high round vowels.

(2.1) Contrasts involving labial consonants in root-initial position preceding a low vowel:

ɓ	ɓáɓa	[ɓáɓà]	'1a.swallow' ⁵¹
p	pápá	[pápá]	'1a.shrew'
b	babă	[bàbă]	'1a.father'
mb [ᵐb] ⁵²	mbămba	[ᵐbăᵐbà]	'9.plants, sp.'
f	fá	[fá]	'dry:FV.IMP'
v	li-vă	[vă] ⁵³	'5-piece of meat'
nv [ᵐv]	nvá	[ᵐvâ]	'1a.dog'
m	mamá	[mâmâ]	'1a.mother'

(2.2) Contrasts involving labial consonants in root-initial position preceding a high vowel:

ɓ	ɓúku	[ɓúkù]	'9.quivers'
p	puká	[pùkâ]	'9.banana trees, sp.'
b	bukú-to	[bùkù]	'13.shrub, drug-13'
mb [ᵐb]	mbúku	[ᵐbúkù]	'1a.antelope' & '9.grave'
f	fulú	[fùlù]	'9.small bow nets'
v	vukúl-á	[vùkúlâ]	'sit down-FV.IMP' ⁵⁴
nv [ᵐv]	ɓí-nvudũnvudũ	[ᵐvùdũᵐvùdũ]	'MOD-fat' ⁵⁵
m	mũ	[mũ]	'3:head'

Labial fricatives /f v nv/ are relatively rare. The distribution of /v nv/ is generally limited to root-initial position. Another example of /v/ root-initially is **mu-vanzíɓɓ** [vânzíɓɓ] '1-small ant, sp.'. The only example of /v/ as the onset of the final syllable of a root in my data is **ku-kuvĩ-ko** '15-mushroom, sp.-15'. Other cases in which /v nv/ occur in root-medial position are due to reduplication. An example of reduplication is **nvínvínvĩ** [ᵐvĩᵐvĩᵐvĩ] '1a.bird, sp.'. This distributional restriction to

⁵¹ Classes 1a and 9 do not have a noun-class prefix.

⁵² In the tables presenting contrasts, the phonetic transcription is added in square brackets.

⁵³ Only the root is given in the phonetic forms in this section.

⁵⁴ This verb refers to a specific way of sitting down, i.e. the way a chief takes a seat.

⁵⁵ **ɓí-** is the general modifier prefix, see Chapter 6.

Labial fricatives have restrictions with respect to the following vowel: /v nv/ are not followed by the [+ATR] mid vowels /e o/. Occurrence in conjunction with the low vowel /a/ is rare for /f/ and /nv/: the only examples in my data are given in (2.1).

Meinhof's law, in its basic form stating that a nasal + voiced consonant becomes a geminate nasal when the next syllable also begins with a nasal, is not found in Liko, cf. **mbamba** above and **ngámá** 'la.chief' in the following examples. An initial nasal-plus-consonant is not simplified by the deletion of the oral plosive.

6	t-babá	[bàbá]	'9a-marsh'
p	pápá	[pápá]	'1a.shrew'
b	mabá	[màbá]	'9.strap'
mb [ᵐb]	lɪ-kámbá	[káᵐbá]	'5-upper arm'
f	-		
v	-		
nv [ᵐv]	-		
m	ngámá	[ᵐgámá]	'1a.chief'

6	mú-nzúú	[ⁿ zùú]	'3-vine, sp.'
p	ndúpú	[ⁿ dùpú]	'1a.buffalo'
b	li-kúbu	[kùbù]	'5-umbilical cord, navel'

mb [ᵐb]	nzumbú	[ⁿzùᵐbú]	'9.edible leaf, sp.'
f	bí-kpǔfu	[kpǔfũ]	'MOD-short'
v	-		
nv [ᵐv]	-		
m	má-pumú	[pùmú]	'6-family need, assistance'

Alveolar consonants

There are no distributional restrictions for alveolar consonants, they occur in all positions in the root. The examples below are given in four sets. The first two sets show alveolar consonants in root-initial position preceding low and high vowels respectively. Contrasts between alveolar consonants in the onset position of the final syllable of the root between either low or high round vowels are presented in the last two sets.

(2.5) Contrasts involving alveolar consonants in root-initial position preceding a low vowel:

ɖ	lí-dǎdǎ	[dǎdǎ]	'5-flame'
t	takpá	[tākᵑpá]	'9.forearm'
d	dǎ	[dǎ]	'1a.friend'
nd [ⁿd]	ndǎta	[ⁿdǎtà]	'9.rope, sp.'
s	sáka	[sákà]	'9.armpit'
z	lu-zagasá	[zàgàsá]	'5-maraca'
nz [ⁿz]	nzá	[ⁿzǎ]	'9.hunger'
n	mu-nama	[nàmà]	'1-siren' ⁵⁶
l	lakí	[làkí]	'9.bush, sp.'

(2.6) Contrasts involving alveolar consonants in root-initial position preceding a high vowel:

ɖ	ɖúlú	[ɖúlú]	'9.heap of leaves'
t	tutú	[tùtú]	'9.forest'
d	dudǔ	[dùdǔ]	'9.rest, remains'

⁵⁶ Spirit in the form of a woman living in the water.

nd [ⁿd]	nduḅó	[ⁿdùḅó]	'1a.fish, sp.'
s	sukó	[sùkó]	'1a.dove, sp.'
z	zukó	[zùkó]	'9.scar'
nz [ⁿz]	nzúki	[ⁿzúkì]	'9.honey'
n	li-nungu	[nùᵑgù]	'5-termite hill'
l	luḅú	[lùḅú]	'1a.debt'

(2.7) Contrasts involving alveolar consonants in the final syllable of the root between low vowels using the frame [a_a]:

ḁ	gáḁá	[gáḁá]	'9.traditional knife'
t	ma-ngatá	[ᵑgátá]	'6-hair'
d	baláda	[bàládà]	'9.home distillery'
nd [ⁿd]	lɪ-gǎnda	[gǎⁿdà]	'5-balance'
s	lɪ-zagasá	[zàgàsá]	'5-maraca'
z	lɪ-ḁambáza	[ḁàᵐbázà]	'5-post'
nz [ⁿz]	mu-ganzá	[gàⁿzá]	'1-blood brother'
n	tana	[tànà]	'1a.small monkey, sp.'
l	ḅú-galá	[gàlá]	'14-tomorrow'

(2.8) Contrasts involving alveolar consonants in the final syllable of the root between high vowels using the frame [u_u] or [u_u]:

ḁ	guḁú	[gùḁù]	'1a.barricade'
t	lɪ-tutú	[tùtù]	'5-termite mound'
d	a-buḁḁ	[bùḁḁ]	'1b-fish, sp.'
nd [ⁿd]	gundu	[gùⁿdù]	'9.midnight'
s	mu-súsú	[sùsù]	'3-bud'
z	úzu	[úzù]	'9.island'
nz [ⁿz]	kúnzú	[kùⁿzù]	'9.plant, sp.'
n	mbúnú	[ᵐbùnù]	'9.band around a braid'
l	lɪ-dulú	[dùlù]	'5-post'

Palatal consonants

Liko has two palatal consonants that occur in all positions in the root. Data to exemplify the contrasts between palatal consonants is given in five sets. In the first

three sets, the palatal consonants precede low, high round and high unrounded vowels respectively. The examples in the second set have a vowel prefix. The third set with the high unrounded vowels /ɪ i/ is added, because it shows that /ny/ can be followed by these vowels. This is significant because /ny/ differs from obstruent-palatal oral sonorant sequences in this respect: the latter do not precede high unrounded vowels in Liko. Set four has palatal consonants as the onset of the final syllable of the root in a frame of two low vowels and set five has them between a high unrounded and a low vowel.

(2.9) Contrasts involving palatal consonants in root-initial position preceding a low vowel:

ny [ɲ]	nyǎsɪ	[ɲǎsɪ]	'9.thatch'
y [j]	yángba	[jǎ ^{am} gbà]	'1a.bird, sp.'

(2.10) Contrasts involving palatal consonants in root-initial position preceding a high round vowel:

ny [ɲ]	ɪ-nyúkú	[ɲúkú]	'9a-dirtiness'
y [j]	a-yúngú	[jú ^o gú]	'1b-whistle, hiss'

(2.11) Contrasts involving palatal consonants in root-initial position preceding a high unrounded vowel:

ny [ɲ]	nyɪk-á	[ɲìk]	'avoid-FV.IMP'
ny [ɲ]	nyikísó	[ɲikísó]	'9.ridicule'
y [j]	yínga	[jĩ ^o gà]	'9.feast'
y [j]	yĩmbó	[jĩ ^m bó]	'INTERJ, surprise!'

(2.12) Contrasts involving palatal consonants in the final syllable of the root between low vowels using the frame [a_a]:

ny [ɲ]	nganyá	[^o gàɲá]	'1a.fish, sp.'
y [j]	yayá	[jàjá]	'1a.older sibling'

(2.13) Contrasts involving palatal consonants in the final syllable of the root between a high and a low vowel using the frame [ʊ_a]:

ny [ɲ]	mbunyá	[^m bùɲá]	'1a.husband'
y [j]	mbuyá	[^m bùjá]	'9.leaf, sp.'

Restrictions with respect to the following vowel are that the palatal nasal /ny/ does not occur preceding the [+ATR] round vowels /u o/ in roots. In addition, when /ny/ is not in root-initial position, it is not followed by any high vowel. The other palatal consonant /y/ does not have such a restriction, e.g. **iyú** [ijú] '9.PRO' and **bu-buyú** [bùjú] '14-tree, sp. (teak)'.

Velar and glottal consonants

Velar consonants occur in all positions in the root, whereas the distribution of the glottal consonant /h/ is limited to the root-initial position. The first two sets of examples below include the velar and glottal consonants in root-initial position preceding low and high vowels. The last two sets show contrasts for the velar consonants in the onset position of the final syllable of the root between either low or high round vowels.

(2.14) Contrasts involving velar and glottal consonants in root-initial position preceding a low vowel:

k	li-kánda	[ká ⁿ dà]	'5-unhusked grain'
g	li-gǎnda	[gǎ ⁿ dà]	'5-balance'
ng [ŋg]	li-ngándá	[ŋgá ⁿ dá]	'5-plant, sp.'
h	-		

(2.15) Contrasts involving velar and glottal consonants in root-initial position preceding a high vowel:

k	kúḃa	[kúḃà]	'1a.turaco'
g	guḃá	[gùḃá]	'1a.monkey, sp.'
ng [ŋg]	nguḃó	[ŋgùḃó]	'9.tree, sp.'
h	yá-hǔ	[hǔ]	'9.ADJ-large area'

The glottal consonant /h/ is relatively rare. Apart from its distributional restriction it also has a limitation on the vowels it precedes. /h/ is not followed by the low vowel /a/ or the [−ATR] high and mid unrounded vowels /ɪ ɛ/. Examples of /h/

with [+ATR] high and mid unrounded vowels /i e/ are **ḡí-hisi** [hìsì] 'MOD-blurred' and **heee ḡí-teee** [hè: ḡítè:] 'INTERJ, exclamation of surprise'.

(2.16) Contrasts involving velar and glottal consonants in the final syllable of the root between low vowels using the frame [a_a]:

k	sáka	[sákà]	'9.armpit'
g	ngága	[^ŋ gágà]	'9.chin'
ng [^ŋ g]	lu-kpánga	[kḡpá ^ŋ gà]	'5-cassava paste'
h	-		

(2.17) Contrasts involving velar and glottal consonants in the final syllable of the root between high vowels using the frame [u_u]:

k	mbúku	[^m búkù]	'1a.antelope' & '9.grave'
g	búgu	[búgù]	'9.plantain, sp.'
ng [^ŋ g]	mbungú	[^m bù ^ŋ gú]	'1a.elephant'
h	-		

Labial-velar consonants

Labial-velar consonants have no distributional restrictions. The examples in the first three sets show the contrasts in root-initial position preceding low, high unrounded and high round vowels. The third set is added in order to show the constraint on the labial-velar oral sonorant /w/ with a following high vowel. The last two sets have labial-velar consonants as the onset of the final syllable of the root between low vowels or preceding the vowel /ɛ/⁵⁷.

(2.18) Contrasts involving labial-velar consonants in root-initial position preceding a low vowel:

kp [kḡp]	kpánga	[kḡpá ^ŋ gà]	'9.cassava paste'
gb [gḡb]	gbandá	[gḡbà ^ŋ dá]	'9.game (play)'

⁵⁷ The frame with two high round vowels cannot be used here because of a restriction with respect to the following vowel for /w/. The alternative frame shows that /w/ is contrastive in root-medial position.

ngb [ᵑᵐgb̥]	ngbángá	[ᵑᵐgbáᵑgá]	'1a.accusation'
w	wánd-á	[wáᵑd́á]	'plan-FV.IMP'

(2.19) Contrasts involving labial-velar consonants in root-initial position preceding a high unrounded vowel:

kp [kp̥]	kpíndi	[kpíᵑdì]	'ADV, early'
gb [gb̥]	li-gbító	[gbítò]	'5-prison'
ngb [ᵑᵐgb̥]	ngbínɡó	[ᵑᵐgbíᵑɡó]	'1a.time, period'
w	windí	[wíᵑdí]	'1a.buzzard, sp.'

(2.20) Contrasts involving labial-velar consonants in root-initial position preceding a high round vowel:

kp [kp̥]	kpúngbú	[kpúᵑᵐgbú]	'1a.hornbill, sp.'
gb [gb̥]	gbundú	[gbùᵑᵐdú]	'1a.forest'
ngb [ᵑᵐgb̥]	ngbundű	[ᵑᵐgbùᵑᵐdű]	'9.mud'
w	-		

Restrictions with respect to the following vowel concern the labial-velar oral sonorant /w/ and the high vowels. In root-initial position, /w/ does not occur before high round vowels. When /w/ is the onset of the final syllable of the root, it does not precede any high vowel.⁵⁸

(2.21) Contrasts involving labial-velar consonants in the final syllable of the root between low vowels using the frame [a_a]:

kp [kp̥]	tákpá	[tákpá]	'9.forearm'
gb [gb̥]	kágbá	[kágbá]	'9.foot'
ngb [ᵑᵐgb̥]	a-kágbá	[káᵑᵐgbá]	'1b-tree, sp.'
w	á-gawa	[gàwà]	'1b-wild sugar cane'

(2.22) Contrasts involving labial-velar consonants in the final syllable of the root between non-low unrounded vowels:

⁵⁸ That is, in non-derived nouns. **mu-tíwí** [tíwì] 'advice' is derived from **-tíw-** [tíw] 'give advice', see 7.12.1.

kp [kp̄]	dɛlɛkpé	[dɛlɛkp̄é]	'9.mushroom, sp.'
gb [gb̄]	a-tígbe	[tígbe]	'1b-sparrowhawk'
ngb [ṁgb̄]	kpéngbé	[kp̄ṁgb̄é]	'1a.finger'
w	ɪwe	[ɪwè]	'2SG.PRO'

b. Same manner of articulation

In order to show contrasts of consonants with the same manner of articulation, but a different place of articulation, examples are given in two sets for consonants in root-initial position preceding a low and a high vowel.

Implosives

(2.23) Contrasts involving implosives in root-initial position preceding a low vowel:

ɓ	ɓak-á	[ɓàk]	'sharpen-FV.IMP'
ɗ	ɗak-á	[ɗàk]	'go up-FV.IMP'

(2.24) Contrasts involving implosives in root-initial position preceding a high vowel:

ɓ	ɓíky-á	[ɓíki] ⁵⁹	'speak-FV.IMP'
ɗ	ɗíky-á	[ɗíki]	'start-FV.IMP'

Voiceless plosives

(2.25) Contrasts involving voiceless plosives in root-initial position preceding a low vowel:

p	pángá	[pá ⁰ gá]	'9.cheek'
t	táng-á	[tá ⁰ g]	'count-FV.IMP'
k	kangá	[ká ⁰ gá]	'9.bed'
kp [kp̄]	kpang-á	[kp̄à ⁰ g]	'kiss-FV.IMP' ⁶⁰

⁵⁹ The final vowel of a verb root is desyllabified between a consonant and verb-final **-a**. For the tone on the final vowel of the verb root, see 4.4.2 and 7.6.

⁶⁰ Lovers: give a kiss, others: embrace with arms around the other.

(2.26) Contrasts involving voiceless plosives in root-initial position preceding a high vowel:

p	pik-ó	[pìk]	'build-FV.IMP'
t	tíko	[tíko]	'9.field'
k	lí-kíkó	[kíkó]	'5-dike'
kp [kp̄]	kpik-ó	[kp̄ìk]	'write-FV.IMP'

Voiced plosives

(2.27) Contrasts involving voiced plosives in root-initial position preceding a low vowel:

b	bă	[bă]	'enlarge:FV.IMP'
d	dă	[dă]	'1a.friend'
g	li-gă	[gă]	'5-epilepsy'
gb [gb̄]	gbă	[gb̄ă]	'reduce:FV.IMP'

(2.28) Contrasts involving voiced plosives in root-initial position preceding a high vowel:

b	bum-á	[bùm]	'hit-FV.IMP'
d	duma	[dùmà]	'1a.lyre'
g	gum-á	[gùm]	'pass again-FV.IMP'
gb [gb̄]	gbum-á	[gbùm]	'forbid-FV.IMP'

Prenasalized voiced plosives

(2.29) Contrasts involving prenasalized voiced plosives in root-initial position preceding a low vowel:

mb [ᵐb]	mbángáná	[ᵐbáᵑgáná]	'1a.fish, sp.'
nd [ᵐd]	ndambú	[ᵐdàᵐbú]	'9.tree, sp.'
ng [ᵑg]	ngángá	[ᵑgáᵑgá]	'9.time, occasion'
ngb [ᵑᵐgb̄]	ngbángá	[ᵑᵐgb̄áᵑgá]	'1a.accusation'

(2.30) Contrasts involving prenasalized voiced plosives in root-initial position preceding a high vowel:

mb [ᵐb]	mbuyá	[ᵐbùjá]	'9.leaf, sp.'
nd [ᵐd]	ndúyá	[ᵐdújá]	'1a.infertile person'
ng [ᵑg]	nguyá	[ᵑgùjá]	'1a.wild boar'

ngb [ᵐgb] ngbundũ [ᵐgbũᵐdũ] '9.mud'

Voiceless and voiced fricatives

Because of the sparsity of words with /f/, /h/ or /v/ only one set of examples is given for voiceless and one for voiced fricatives.

(2.31) Contrasts involving voiceless fricatives in root-initial position preceding a high vowel:

f	fúkúm-á	[fúkúm]	'shove with a stick-FV.IMP'
s	sukúḏ-á	[súkúḏ]	'try in vain to dig-FV.IMP'
h	huky-á	[húkí]	'strive for honour-FV.IMP'

(2.32) Contrasts involving voiced fricatives in root-initial position preceding a high vowel:

v	vukúl-á	[vúkúl]	'sit down-FV.IMP'
z	zúkúl-á	[zúkúl]	'shake-FV.IMP'

Prenasalized voiced fricatives

(2.33) Contrasts involving prenasalized voiced fricatives in root-initial position preceding a low vowel:

nv [ᵐv]	ɪ-nvá	[ᵐvá]	'1c-dog'
nz [ᵐz]	nzá	[ᵐzá]	'9.hunger'

(2.34) Contrasts involving prenasalized voiced fricatives in root-initial position preceding a high vowel:

nv [ᵐv]	nvunvú	[ᵐvũᵐvú]	'9.down, fluff'
nz [ᵐz]	nzunzú	[ᵐzũᵐzú]	'9.swarm'

Nasal sonorants

(2.35) Contrasts involving nasals in root-initial position preceding a low vowel:

m	mamá	[mámá]	'1a.mother'
n	nála	[nálà]	'9.braids, sp.'
ny [ɲ]	nyamá	[ɲámá]	'1a.animal, beast'

(2.36) Contrasts involving nasals in root-initial position preceding a high vowel:

m	míkí	[míkí]	'1a.child'
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n	níné	[níné]	'1a.aunt' ⁶¹
ny [ɲ]	nytk-á	[ɲìk]	'avoid-FV.IMP'

Oral sonorants

(2.37) Contrasts involving oral sonorants in root-initial position preceding a low vowel:

l	lakí	[làkí]	'9.bush, sp.'
y [j]	yáɲ	[jáɲ]	'INTERR, where'
w	waní	[wàɲ]	'INTERR, 1a.who'

(2.38) Contrasts involving oral sonorants in root-initial position preceding a high vowel:

l	lind-ó	[lì ⁿ d]	'sink-FV.IMP'
y [j]	yĩmbó	[jĩ ^m bó]	'INTERJ, surprise!'
w	windí	[wì ⁿ dí]	'1a.buzzard, sp.'

2.2.3 Airstream mechanisms

All Liko consonants are produced by means of the pulmonic egressive airstream mechanism except two contrastive voiced consonants at the labial and alveolar places of articulation, which are produced by means of glottalic ingressive airstream, /b/ and /d/. They are both voiced. I refer to them as 'implosives'. The way they are produced in Liko is as Maddieson formulates (2003:28):

"The segments labeled as implosives are sometimes described as if a glottal constriction is characteristic of their production. In Bantu, this is typically not the case; the vocal folds are in the normal position for voicing. Rather, what is critical is that the larynx is lowering during their production, so that the size of the supralaryngeal cavity is being enlarged while the oral closure is maintained. This may have two principle effects - first, it allows the amplitude of vocal fold vibration to increase during the closure, giving a particularly strong percept of voicing at the time of the release, and second, it may mean that the intra-oral pressure is relatively low at the time when the closure is released so that at the moment of release the initial airflow is ingressive."

⁶¹ I.e. father's sister.

2.2.4 Manner of articulation

The consonants produced with egressive airstream are divided according to their manner of articulation: plosives, fricatives, nasal and oral sonorants. Plosives and fricatives are further subdivided into voiced and voiceless sets - there is no such contrast with nasals and oral sonorants. The voiceless plosives /p t k kp/ are unaspirated. Prenasalization is only found with voiced plosives and voiced fricatives. The nasal is homorganic to the following consonant with respect to place of articulation.

The alveolar trill [r] has not been included in Table 2 with Liko contrastive consonants, because it does not occur in nouns, verbs, adverbs or adjectives. It is found exclusively in some ideophones and interjections:

(2.39) Alveolar trill [r]:

ḡí-rrr	[ḡír:]	'MOD-shiver'	<i>ideophone</i>
ḡí-byerrr	[ḡíbjèr:]	'MOD-ripe'	<i>ideophone</i>
arurr	[àrùr:]	'ouch!'	<i>interjection</i>
rígo	[rígò]	'hurrah!' ⁶²	<i>interjection</i>
irryá	[ír:já]	'pull!'	<i>interjection</i>

Ameka (2001:30) notes that in general, deviations from canonical phonological patterns - in this case the [r] - as well as lengthening for expressive purposes are characteristics of ideophones and interjections. All words with an alveolar trill fall into one of these categories. There is one reported Mangbetu loanword in my data which is pronounced with an alveolar trill: **á-trabá** [átràbá] '1b-small pottery tool'. If Congo Swahili or French words with a rhotic consonant are borrowed, the rhotic consonant is usually rendered with the lateral sonorant /l/ in Liko.

(2.40) Loanwords from Congo Swahili or French with rhotic consonant:

li-dilísa	[dílísà]	'5-window'	<i>dirisha</i> (Congo Swahili)
balúwa	[bàlúwà]	'1a.letter'	<i>barua</i> (Congo Swahili)
gilípe	[gílípè]	'9.flu'	<i>grippe</i> (French)
kaltéle	[kàlìjélè]	'9.quarry' (gold)	<i>carrière</i> (French)

⁶² A slogan used in circumcision rites.

If the lateral sonorant /l/ occurs root-initially, it is always produced as a lateral, but when it occurs intervocalically, in particular between two identical vowels, it has the alveolar lateral flap [ɭ] (or perhaps the alveolar flap [ɾ]) as allophone, e.g. **ká-al-á** [káàlá] / [káàɭá] '9b-chop-FV'⁶³, **a-bála** [àbálà] / [àbálɭà] '1b-concubine, mistress' and **ɪ-ngbóɭ** [ɪ̃^mgbóɭ] / [ɪ̃^mgbóɭɭ] '1c-dugout'.

Labial-velar plosives /kp gb ngb/ constitute a special case: the labial part of the consonant may be realized as voiceless or voiced bilabial trill. I have analysed these sounds as labialized labial-velar plosives. Since this phenomenon is not found very often in Bantu languages⁶⁴, I have listed all examples in my data (almost all of them are expressive, more than half are ideophones, some may be repeated):

(2.41) Bilabial trill [B]:

ɓí-kpwaaa	[kɓà:]
'IDEO, MOD-sound of small hard objects hitting the ground'	
ɓí-kpwě	[kɓě]
'IDEO, MOD-s.th. breaks with a snap'	
kpwíngi	[kɓí ⁿ gì]
'1a.lion'	
kó-kpwit-ó	[kɓìt]
'9b-jump down from high-FV'	
-kpwǎ	[kɓǎ]
'ADJ, narrow, closed (e.g. a bag)'	
ɓí-kpwú	[kɓú]
'IDEO, MOD-difficult entry'	
gbwaaa	[gbà:]
'IDEO, sound of wood breaking'	

⁶³ Infinitive forms are analyzed as verbal nouns, in noun-class 9b.

⁶⁴ Probably words with the bilabial trill and the bilabial trill as a sound are borrowed from Mangbetu. Several of these words were recognized by a Mangbetu speaker, M. Lokpari Philippe, Professeur des langues africaines at the ISP in Isiro in 2013, with similar or different meaning. In Liko, the bilabial trill is stronger compared to Mangbetu. Mangbetu has /pw/, /bw/ and /mbw/, Lombi, a language spoken to the southwest of the Liko area, has /pw/, /kpw/, /bw/, /gbw/, /mbw/ and /ngbw/, Kutsch Lojenga, p.c.

gbwanga6a	[gbà ^ɔ gà6à]
'INTERJ, "I caught s.th.!" '	
ɪ-gbwégbwɛ	[gbégbè]
'9a-twig'	
6í-gbwengebɛgbwengebe	[gbè ^ɔ gèbègbè ^ɔ gèbè]
'IDEO, MOD-hobble along'	
6í-gbwua-gbwua	[gbùàgbùà]
'IDEO, MOD-hurts the teeth when chewing'	
nǎ-gbwua	[gbùà]
'na:1-rope for harvesting mangos'	
gbwu	[gbù]
'IDEO, sound of a drum: "war!" '	
ó-gbwuo-gbwúó	[gbùògbúó]
'1b-withered maize on the field'	
6í-ngbwí	[^m gbí]
'IDEO, MOD-disorderly'	

2.2.5 Place of articulation

The place of articulation of a consonant is generally named for the passive articulator. To account for the Liko underlyingly contrastive consonants, the more usual designations for places of articulation are used: labial, alveolar, palatal and velar. In addition, the Liko consonant chart has a column "glottal" for the glottal fricative /h/ and a column "labial-velar" for the double plosives /kp, gb, ngb/ and the oral sonorant /w/.

The consonants /d/ and /l/, although produced somewhat more backwards than the alveolar ridge, are listed with the consonants realized at the alveolar ridge, because there is no contrast between consonants produced at and behind the alveolar ridge.

2.2.6 Complex consonants

Several kinds of complex consonants occur as syllable onsets: labial-velar plosives and prenasalized obstruents. They are analysed as multiple articulations linked to a single C-slot, based on simultaneity of articulation in the case of labial-velar plosives and on homorganic behaviour in the case of prenasalized obstruents. Articulation differs between labial-velar plosives on the one hand and prenasalized

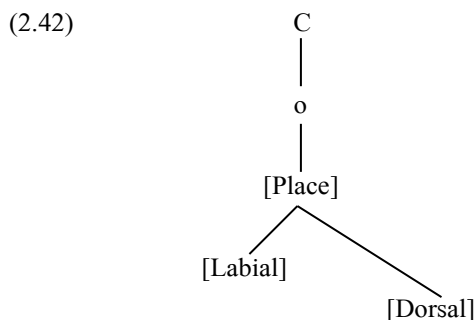
obstruents on the other in that articulation is simultaneous for the first plosives and sequential for the latter. The prenasalized labial-velar plosive [$\widehat{\text{mgb}}$] has both simultaneous and sequential articulation.

Within the framework of autosegmental phonology, it is possible to represent multiple articulations within a segment by many-to-one associations to a single timing unit. In the representations of these consonants, the following feature specifications are used: [Labial], [Coronal] and [Dorsal] for place of articulation (i.e. labial, alveolar and velar⁶⁵ respectively, generalized where applicable as [Place]) and a primitive feature [nasal] for the initial element of prenasalized obstruents. Features that are the same for the different articulators are not overtly specified in the representations.

a. Simultaneous Articulation

There are two consonants with simultaneous articulation within a single C-slot: the voiced and the voiceless labial-velar plosives [$\widehat{\text{kp}}$, $\widehat{\text{gb}}$]. The two simultaneous articulations differ in their place of articulation only, while they are the same for manner of articulation and for voicing.

The representation for labial-velar plosives is:



⁶⁵ Dorsal can refer to both the palatal and the velar places of articulation; in Liko it is not necessary to further specify Dorsal in [$\pm$ back] because Liko does not have palatal obstruents.

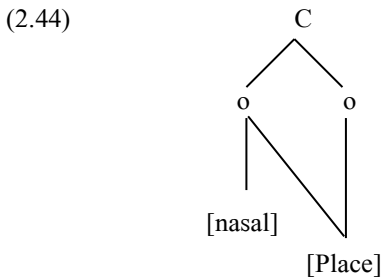
Examples include:

(2.43)	kpáká	[kᵑáká]	'9.trap'
	kpɪ̀bá	[kᵑɪ̀bá]	'9.joke'
	kpúkú	[kᵑúkú]	'9.handcuffs for a madman'
	gbángítá	[ḡbáᵑgítá]	'9.thick forest'
	li-gbitókú	[ḡbítókú]	'5-proverb'
	gbundú	[ḡbùᵑdú]	'1a.forest'

b. Sequential Articulation

Prenasalized consonants in Liko are homorganic and voiced. Prenasalization is found exclusively with voiced obstruents. Most frequent are combinations of a nasal and the voiced plosives, i.e. [ᵐb, ᵑd, ɠg] or with the voiced fricative [ᵑz]. Combinations with the voiced labial fricative [ᵐv] are rare. The nasal is unspecified for place of articulation. Its feature specification is obtained through spreading from the place of articulation of the obstruent.

The prenasalized obstruents are analysed as complex consonants, represented as follows:



The segmental status of NC sequences is hard to resolve when a language does not have a phonological contrast between intervocalic prenasalized segments and NC clusters. The obstruent in /mb nd ng ngb nv nz/ in most cases does not cause a following H tone to be realized LH (see 4.5). This means that prenasalized obstruents have to be treated as complex consonants. Examples of nouns stems in which /mb nd ng ngb nv nz/ are the onset of a syllable with a H tone include:

(2.45)a.	mbígo	[ᵐbígò]	'9.drill'
	ndúmbú	[ᵑdúᵐbú]	'9.nudity'

b.	ndúyá	[ⁿ dúyá]	'1a.infertile person'
	pándá	[pá ⁿ dá]	'9.scabies'
c.	bu-ngámá	[bù ⁿ gámá]	'14-wealth, kingdom'
	lóngú	[ló ⁿ gú]	'1a.duiker'
d.	ngb́ngó	[^ŋ mgb́ ⁿ gó]	'1a.time, moment'
	súngbú	[sú ^ŋ mgbú]	'1a.uninhabited area'
e.	nvínvínví	[ⁿ ví ^m ví ^m ví]	'1a.bird, sp.'
f.	nzénzè	[ⁿ zè ⁿ zè]	'1a.bat'
	mu-mbánzú	[mù ^m bá ⁿ zú]	'1-person'

In verb roots, the voiced obstruents /b d g gb v z/ are never followed by a H tone if they occur as the first consonant of the root. Examples of verbs (in Infinitive forms) in which prenasalized consonants are the onset of the first syllable of the verb root with a H tone include:

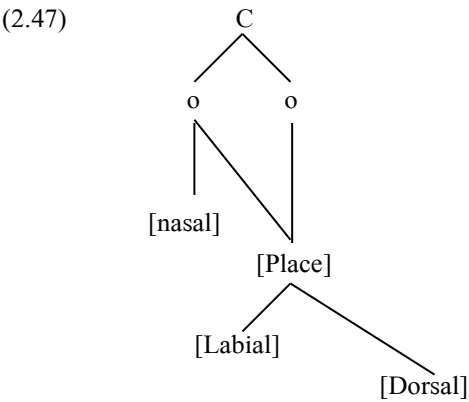
(2.46)a.	kó-mbímb-ó	[kó ^m bí ^m bó]	'9b-throw-FV'
b.	ká-ndúng-á	[ká ⁿ dú ⁿ gá]	'9b-discover-FV'
c.	ká-ngát-á	[ká ⁿ gátá]	'9b-ripen-FV'
d.	ká-ngbát-á	[ká ^ŋ mgbátá]	'9b-play an instrument-FV'
e.	ká-nvínvíly-á	[ká ^m ví ^m vílyá]	'9b-suck-FV'
f.	ká-nzúǵ-á	[ká ⁿ zúǵá]	'9b-despise-FV'

Additional support comes from the observation that N is not a noun-class prefix synchronically and from the distribution of NC sequences. Liko does not have nasal prefixes, for instance, the plural form of **mbungú** [^mbùⁿgú] '1a.elephant' is **6a-mbungú**, not ***6a-bungú**, and the plural of **ndumbí** [ⁿdù^mbí] '9.fight' is **6a-ndumbí**, not ***6a-dumbí**. The distribution of prenasalized consonants is not limited to root-initial position, they also occur root-medially or as the onset of the final syllable, e.g. **pambálá** [pà^mbálá] '9.eruption', **gbóndúká** [gbúⁿdúká] '1a.clay jar', **mu-vanzí66** [vàⁿzí66] '1-small ant', **gbǒnguló** [gbǒⁿgùló] '9.drying rack' and **kpángbála** [kpá^ŋmgbála] '9.wall of a house'.

The prenasalized labial-velar plosive [^ŋmgb] consists of simultaneous articulation of the [Labial] and [Dorsal] articulators, preceded by a nasal. The underlyingly unspecified nasal receives its specification for place of articulation from the labial-velar plosive, and is therefore homorganic to it. The labial-velar plosive is a

complex segment with simultaneous articulation for its places of articulation. When it is prenasalized, the prenasalization assumes both articulations.

The representation for prenasalized labial-velar plosives is:



Examples include:

- (2.48) ngbángba [ᵑᵐgbáᵑᵐgbà] '9.temporary shelter'
 lɪ-ngbíngbí [ᵑᵐgbɪᵑᵐgbɪ] '5-swelling of the testicles'
 mɯ-ngbɔngbɔ [ᵑᵐgbɔᵑᵐgbɔ] '3-banana tree trunk'

2.3 Vowels

2.3.1 Inventory of vowels

Liko has a nine-vowel system with ATR harmony. The vowels are presented in Table 4.

Table 4 Liko vowel chart

	[− ATR]		[+ ATR]	
	[− back]	[+ back]	[− back]	[+ back]
	[− round]	[+ round]	[− round]	[+ round]
[+ high]	ɪ	ʊ	i	u
[− high, − low]	ɛ	ɔ	e	o
[+ low]	a			

As mentioned above, Liko has a type of vowel harmony based on ATR, displaying both root-internal [ATR] agreement and harmony at the word level. [+ATR] is the dominant feature within its domain. There is no low [+ATR] vowel, but the low [−ATR] vowel /a/ can co-occur with [+ATR] vowels in root morphemes. In contexts in which /a/ undergoes vowel harmony triggered by a dominant [+ATR] value, it has the [−low, +round] vowel /o/ as its [+ATR] counterpart. For a treatment of ATR vowel harmony, I refer the reader to the next chapter on Phonological Processes.

An impression of Liko vowel-formant means shows that the [+round] vowels /u/ and /o/ are perceptually very close; they have almost the same F1 values. Each point in the chart represents the mean of ten tokens of vowels in the penultimate position in words spoken by a male speaker. Recordings are from Jean-Pierre Kamenabake in 2010, measurements are done by me.

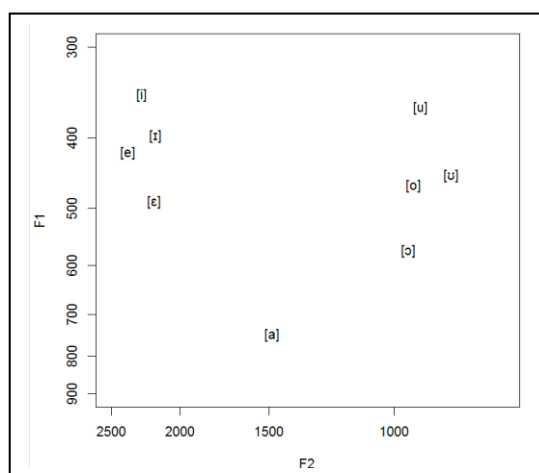


Figure 2: Liko vowel-formant means

2.3.2 Vocalic contrasts

The following sets exemplify the contrasts between the vowels. The first set shows contrasts between [−ATR] vowels, and the second between [+ATR] vowels (and the [−ATR] vowel /a/), while in the third set vowels with a different [ATR] value are contrasted.

(2.49) Contrasts involving [–ATR] vowels /ɪ ɛ ɔ ʊ/:

ɪ - ʊ	mu-mbanzí	[^m bà ⁿ zɪ]	'3-rib'
	mu-mbánzú	[^m bá ⁿ zú]	'1-person'
ɪ - ɛ	títu	[títu]	'1a.bird, sp.'
	títé	[títé]	'1a.grandparent'
ɪ - ɔ	něki	[někì]	'ADV, therefore'
	nékɔ	[někò]	'1a.fetish'
ɪ - a	kángu	[ká ^ɔ gì]	'1a.snake, sp.'
	kánga	[ká ^ɔ gà]	'1a.guinea-fowl'
ʊ - ɛ	a-mbú	[^m bú]	'1b-bush, sp.'
	a-mbé	[^m bé]	'1b-fish, sp.'
ʊ - ɔ	bí-gbu	[gbù]	'IDEO, MOD-full'
	bí-gbo	[gbò]	'IDEO, MOD-fetid'
ʊ - a	lɪ-ɓagú	[ɓàgú]	'5-kick with the foot'
	lɪ-ɓagă	[ɓàgă]	'5-hole'
ɛ - ɔ	lɪ-kě	[kě]	'5-tree, sp.'
	lɪ-kɔ	[kɔ]	'5-spring'
ɛ - a	mu-balá	[bàlá]	'3-curse'
	mu-bele	[bèlè]	'1-big monkey, sp.'
ɔ - a	lɪ-gɔ	[gɔ]	'5-cola nut'
	lɪ-gă	[gă]	'5-epilepsy'

(2.50) Contrasts involving [+ATR] vowels /i e o u/ and the [–ATR] vowel /a/:

i - u	li-bí	[bí]	'5-group, clan'
	li-bú	[bú]	'5-ashes'
i - e	i-wíli	[wíli]	'9a-area, courtyard'
	í-welé	[wèlé]	'1c-edible snail, sp.'
i - o	ɓu-likí	[likí]	'14-seat'
	ɓu-likó	[likó]	'14-tree, sp.'
i - a	ngíngí	[^ɔ gí ^ɔ gí]	'1a.stupid person'
	ngángá	[^ɔ gá ^ɔ gá]	'9.time, occasion'
u - e	i-bombú	[bò ^m bú]	'9a-pond, lake'
	i-bembé	[bè ^m bé]	'1c-tree, sp.'
u - o	bí-kpù	[kpù]	'IDEO, MOD-close firmly'
	bí-kpö	[kpö]	'IDEO, MOD-pouring water'

u - a	ngundú	[ⁿ gù ⁿ dú]	'9.emptiness'
	ngandá	[ⁿ gà ⁿ dá]	'9.placenta'
e - o	i-ngbé	[^m gbé]	'9a-pole'
	i-ngbo	[^m gbò]	'1c-aardvark'
e - a	li-kembé	[kè ^m bé]	'5-thumb piano'
	lu-kámbá	[ká ^m bá]	'5-upper arm'
o - a	bóbo	[bóbò]	'1a.dumb man'
	bába	[bábà]	'1a.swallow, sp.'

(2.51) Contrasts involving vowels with a different [ATR] value:

ɪ - i	ma-lílí	[lílí]	'6-food'
	mólílí	[mólílĩ]	'1a.bird, sp.'
ʊ - u	mũ-ḍungú	[ḍũḡú]	'3-clay block'
	mu-ḍungú	[ḍũḡú]	'3-back side of a house'
ɛ - e	li-senzé	[sè ⁿ zé]	'5-tree, sp.'
	li-sénzé	[sé ⁿ zé]	'5-flute'
ɔ - o	bí-bó	[bó]	'IDEO, MOD-very good'
	bí-bó	[bó]	'ADV, MOD-at daybreak'

The following words in my data have free variation of the high vowel in the root (the [+round] variant is most common)⁶⁶:

(2.52)	kó-pútút-ó	[kópútútó]	[kópútútó]	'9b-hug-FV'
	mu-úzi ⁶⁷	[mùúzi]	[mùizi]	'3-cord, thread'
	(s)ɪ-bukú-sɔ ⁶⁸	[ìbùkúsɔ̃]	[sìbikúsɔ̃]	'19-shrub, drug-19'

⁶⁶ In these examples, I have included the prefixes and the suffixes in the phonetic representation.

⁶⁷ From Congo Swahili *uzi* 'thread, cord'.

⁶⁸ The prefix-initial /s/ is optional.

2.4 Syllable structure

Liko syllable structures are listed and exemplified below:

Table 5 Liko syllable structures

Syllable	Example		
V	úzu	[ú.zù] ⁶⁹	'9.island'
CV	díkídĩ	[dì.kí.dĩ]	'9.secret'
CGV	nasyagí	[nà.sjà.gí]	'1a.edible mushroom, sp.'

The most common syllable structures within roots in the language are CV and V. CV-, V- and CGV-syllables occur in all positions in the word.

CV-syllables in word-initial, word-medial and word-final position:

- (2.53) pǔ [pǔ] '1a. rat, sp.' & '9.edible mushroom'
 púku [pú.kù] '9.cloud'
 bǒpuwó [bǒ.pù.wó] '1a.adult man who will be circumcised'
 bǒkolopú [bǒ.kò.lò.pú] '9.parasite (plant), sp.'

Liko does not have syllabic nasals. Prenasalized consonants are analysed as single complex stem-initial consonants (see 2.2.6). They form the onset of the syllable, which is confirmed by Liko-speakers' intuitions about the syllables of their language. Words with a prenasalized consonant like **mbóku** [ʰmbókù] '1a.adult' and **i-zǒmbu** [izǒʰmbù] '9a-vine, sp.' are judged by the Liko consultants I worked with to be best syllabified as [ʰmbókù] and [izǒʰmbù], not as *[m.bókù] or *[i.zǒm.bù]. This also applies to the prenasalized labial-velar plosives, e.g. **ngbínɡó** [ŋʰmbínɡó] '9.time, moment' and **ɗungbú** [dù.ŋʰgbù] '1a.slit drum'.

V-syllables in word-initial, word-medial and word-final position:

- (2.54) ópé [ó.pé] '1a.taboo food'
 maďáaní [mà.ďá.à.ní] '1a.parasite (plant), sp.'
 í-gbukúu [í.ɡbù.kú.ù] '1c-carp'

⁶⁹ I follow the IPA where syllables are shown by separating them with a period as boundary symbol.

In the last two examples, the vowels in **dáa** and **kóu** are analysed as a sequence of two short vowels, not as a long vowel. Firstly, there is no process in Liko in which a short vowel becomes a long vowel. Secondly, when V₁-elision or height coalescence applies in the environment of two vowels across a morphological boundary, it results in one short vowel (see 3.3.1, 3.3.2 and 3.3.3).

Other examples of CV-syllables followed by a V-syllable include:

(2.55)	i-wíí	[i.wí.í]	'9a-dance'
	mádíí	[má.dí.ì]	'6-banana tree, sp.'
	i-kwíí	[i.kwí.ì]	'9a-eyelash'
	sít-sít	[sít.sí.ì]	'1a.bird, sp.'
	ɪ-kwíí	[ì.kwí.ì]	'9a-eyelid'
	kuú	[kù.ú]	'9.publicity, announcement'
	mu-túu	[mù.tú.ù]	'3-advice'
	ngóo	[^h gó.ò]	'1a-buzzard, sp.'
	sóko	[sò.ó.kò]	'1a.bean'
	másáá	[má.sá.á]	'ADV, three times'

The first two slots of the verb root are repeated when a noun is derived, e.g.

-bungusi- [bù.ngù.sì] 'repair', **li-bubungusyó** '5-arrangement, preparation'. If a noun is derived from a verb root in which the second syllable is a V-syllable, only the consonant and the first vowel are repeated: **-búuli-** [bú.ù.ì] 'look after, protect', **li-búbuulyó** 'protection'.

In my data there are two verb roots with VV root-initially, **ká-út-á** [ká.ì.í.tá] '9b-change-FV' and **kó-uús-ó** [kó.ù.ú.só] '9b-ask-FV'. The first vowel does not belong to the root, because it does not bear the primary tone (see 4.4.2), as is clear from the Future verb form **núta** 'I will change'. In Liko, the primary tone is linked to the first tone-bearing unit (TBU) of the verb root, which is the second syllable in this case.⁷⁰

⁷⁰ The first vowel is probably an inherent reflexive prefix, see 7.3.

The examples in (2.56) show CGV in word-initial, word-medial and word-final position, (2.56a) the palatal oral sonorant, (2.56b) the labial-velar oral sonorant:⁷¹

- (2.56)a. *lɪ-ɸyɛ* [lɪ.ɸjɛ́] '5-hole'
 kyɛ [kjɛ́] 'CONJ, because'
 pyekú má [pjè.kú.má] '1a.monkey, sp.'
 syogbú [sjò.ɡbú] '1a.hunting spear'
 mu-ngizyö [mù.^ɳgì.zjǒ] '1-ant, sp.'
- b. *pw-á* [pwá] 'pick-FV.IMP'
 ɸwálí [ɸwà.lí] '14:sperm'
 ɸa-na-kwálí [ɸà.nà.kwá.lí] '2-na:1-sparrowhawk'
 mu-súkwá [mù.sú.kwá] '1-caterpillar'

The consonant and the palatal or labial-velar oral sonorant form a branching onset. With respect to the distribution of branching onsets with an oral sonorant, there are some restrictions on the first consonant. Labial fricatives [f, v, ^ɱv] hardly ever occur as the first consonant of a branching onset, neither in roots nor at morphological boundaries.⁷² Labial-velar plosives [kp, gb, ^ɱgb] are never followed by a palatal oral sonorant. Examples of labialized labial-velar plosives are given above, in (2.41).

Branching onsets with a palatal or labial-velar oral sonorant are rarely followed by a high vowel. The only cases in my data with the palatal oral sonorant are **ɸu-kyóngǔ** [kjú.^ɳgǔ] '14-vine, sp.' and **ɸyĩ** [ɸjĩ] 'ADV, far'. For the labial-velar oral sonorant, a following high vowel is limited to branching onsets with a velar plosive, e.g. **ká-gwĩ** [gwĩ] '9b-grab, hold s.o.-FV', **mu-kwíno** [kwínò] '1-orphan'. Other examples of CGV-syllables, with different consonants, are given below.

(2.57) G is the palatal oral sonorant [j] in:

- pyekú má* [pjè.kú.má] '1a.monkey, sp.'
mbyémbyɛ [^ɱbjɛ́.^ɱbjɛ́] '1a.fish with red belly'

⁷¹ The lateral oral sonorant never occurs as the second consonant.

⁷² The only exceptions in my data are **kó-fy-ó** '9b-hiss, wheeze-FV' and the ideophones **ɸɸ-fwaaa** 'sound of s.th. pulled over a surface' and **ɸɸ-fwaka-fwaka** 'sound of dry leaves'.

li-buđya	[li.bù.đjá]	'5-modern time or behaviour'
li-syɔgɔ	[li.sjɔ̌.gɔ]	'5-unripe palm nut'
zułyá	[zù.ljá]	'1a.bird, sp.'
kyɔkyɔ̌ɔ̌	[kjɔ̌.kjɔ̌.ɔ̌]	'1a.bird, sp.'
li-nyéngye	[li. ^h gje. ^h gje]	'5-pebble'

(2.58) G is the labial-velar oral sonorant [w] in:

pwáyi	[pwá.jì]	'9.wound'
mu-mbwogɔ	[mù. ^m bwò.gɔ]	'1-edible caterpillar'
li-ndwáɬ	[li. ^h dwá.li]	'5-plant, sp.'
ɪ-swé	[ì.swé]	'9a-hoof'
bugwé	[bù.gwé]	'1a.uncle'
mù-kwá	[mù.kwá]	'1-enemy'
móngwɔ	[mó. ^h gwɔ]	'1a.arrow'

The phonetic nature of the palatal or labial-velar oral sonorant in CGV-syllables

Liko has a series of phonetically palatalized and labialized consonants which are in surface contrast with their plain counterparts, but which are either historically or synchronically the product of desyllabification of underlyingly high vowels.⁷³ Spectrograms show a separate voiced segment between the consonant and the [–high] vowel which lasts several tens of milliseconds.

In **mázyá** '9.malaria', for example, the F2 value in the middle of this interval of time is 2092 Hz (F2 baseline values for the same male speaker are 2164 for [ɪ] and 1485 for [a]), which gives phonetic support for an analysis as /mázíá/ instead of /mázyá/. An analysis as [zyá] would be feasible if F2 would have a low value at

⁷³ In his first analysis of the Liko phonology Casali (2004:5) commented: "Since a case can be made that palatalized consonants arise from underlying prevocalic /Ci/ and /Cɪ/ sequences, and since palatalized velar plosives do not contrast in Liko with palatal plosives (the two to some extent being in free variation), palatal plosives might plausibly be analysed as deriving via glide formation from underlying /CV/ sequences in which C is a velar plosive and V a high front vowel." In Bantu languages, Hyman (2003:55) says that the "post-consonant glides [y] and [w] are typically derived from underlying vowels."

the release of the oral sonorant and would move more or less immediately toward to the value of [a]. This is not what happens in Liko.⁷⁴

Likewise, in **ḃṓ-ḃwá** '14-size', the F2 value in the middle of the segment between [ḃ] and [á] is 686 Hz (F2 baseline value of [u] for the same male speaker is 830), hence [ḃṓḃwá].

Compare the length of the voiced segment between the consonant and the length of the vowel in the following spectrograms:

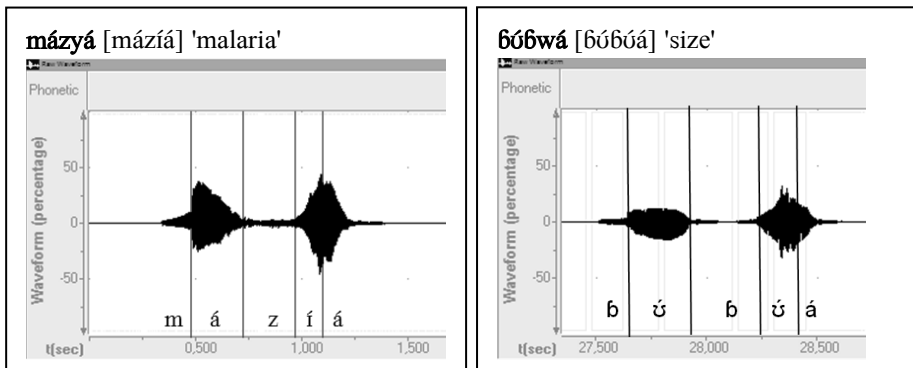


Figure 3: Spectrograms of **mázyá** and **ḃṓ-ḃwá**.

In the environment between a consonant and a vowel, the vowel following the consonant is desyllabified (see 3.3.5), resulting in a branching syllable onset.

Other possible analyses, as palatal consonants, or as secondary articulation conflict in one way or another with the phonetic data. The sequences of a consonant and a palatal oral sonorant are not analysed as palatal consonants, because spectrograms suggest that these sequences consist of two separate segments, the consonant and a voiced segment. The analysis of the voiced segment, being secondarily articulated to the onset, thus forming a complex segment (C^vV or C^wV), lacks contrasts in Liko between consonants with and without this secondary articulation (e.g. C^wV vs. CwV).

⁷⁴ I would like to thank Rod Casali, p.c., for his ideas to investigate the phonetics of glides.

Glides

The phonological status of glides is ambiguous. In some cases, a glide is clearly consonantal, as can be seen in the contrasts between the palatal and labial-velar oral sonorants in root-initial position (see 2.2.2). In other cases, the glide is derived from an underlying vowel as in disyllabic verb roots by desyllabification of the root-final vowel (see 3.3.5), or the glide is a vowel phonetically, but part of a branching onset as in the above CGV sequences.

If, in a certain context, the glide is not homorganic with either of its adjacent vowels, it is analysed as inherent, i.e. having contrastive consonant status.

Examples are **-wawă** [wàwă] 'ADJ, biting (wound)', **yayá** [jàjá] '1a.older sibling', **ɪ-wayá** [ìwàjá] '9a-dried banana leaf', **á-gawa** [ágàwà] '1b-wild sugar cane', **ká-táy-á** [kátáyá] '9b-put the hand in s.th.-FV', **ká-sáw-á** [kásáwá] '9b-carry s.th. by strap over the shoulder-FV', **mu-poyó** [mùpòjò] '1-mysterious creature', **mu-goyó** [mùgòjò] '1-flea', **mu-buyó** [mùbùyó] '1-caterpillar, sp.'. Examples of sequences of non-high vowels of different vowel height with an intervening oral sonorant are: **kpóya** [kpójà] '9.dance', **a-gángeya** [àgá^hgèjà] '1b-tree, sp.', **í-kawé** [íkàwé] '9a-scabies', **bákayo** [bákàjò] 'like that (conclusion)'.

Loanwords

Loanwords are adapted to the Liko phonology and syllable structures. Consonant clusters and consonants in word-final position in the source language conflict with the Liko system, which does not have closed syllables. Liko speakers add an epenthetic vowel between the consonants of a cluster and after a word-final consonant, or they delete a word-final consonant. The epenthetic vowel is often a high unrounded vowel.

Examples include:

(2.59)	li-bilíki	[lìbilíki]	'5-brick'	<i>brique</i> (French)
	pastéle	[pàsítélè]	'1a.pastor'	<i>pasteur</i> (French)
	sáki	[sàki]	'1a.bag'	<i>sac</i> (French)
	masě	[màsě]	'1a.nun'	<i>ma soeur</i> (French)

2.5 Word structure

2.5.1 Nouns

Nouns consist of a stem, a prefix and, for some nouns, an enclitic. The predominant and basic syllable pattern for noun stems in Liko is -CVCV, accounting for over half of the noun stems, followed by -CVCVCV at a distance. A sizeable minority of noun stems, over 100 in my data, has a monosyllabic -CV structure. A V-syllable in noun stems is rare. Noun-class prefixes have the shape CV- or V-. Noun-class enclitics have the structure -CV.

Noun stems of more than three syllables exist, with a maximum length of five CV-syllables in my data. Four-syllable noun stems are about as frequent as monosyllabic CV-roots, but the majority of nouns with more than three syllables consist of reduplicated forms of various types (mostly without existing corresponding non-reduplicated form).

The following words are examples of nouns with four syllables without reduplication:

- (2.60) kúmbélendú [kú^mbélèⁿdú] '1a.small house'
 mu-ndongongbíli [mùⁿdò^ŋgò^mgbíli] '3-tendon'

Examples of four-syllable noun stems with some type of reduplication:

- (2.61) kúyakúya [kújàkújà] '1a.calao, sp.'
 mu-bídebíde [mùbídēbídē] '3-top of a tree'
 gbagbăsyangí [gbàgbàsjà^ŋgí] '9.tree, sp.'
 mángbéngbetú [má^mgbé^mgbètú] '1a.small fish, sp.'
 si-gogobé [sì-gògòbé] 'sr:1-squirrel, bird, sp.'

A few five-syllable noun stems occur in my data without apparent reduplication or apparent traces of compounding, e.g. **tíndílígbutí** [tíⁿdílígbití] '9.plant, sp.', **a-mbílímásùká** [m^mbílímásùká] '1b-snake, sp.' and **tákálágbumu** [tákálágbòmù] '1a.insect, sp.'. Other five-syllable noun stems are likely to have reduplication, e.g. **li-didiyapadá** [dìdìyàpàdá] '3-vine, sp.' and **mu-fofokótíbí** [fòfòkótìbì] '3-vine, sp.',

or they are compounds with an associative prefix, e.g. **mu-lípyómándugá** [lípyómándùgá] '3-vine, sp.'.

2.5.2 Verbs

The most common structure of a verb root in Liko is -CVC-. Consonants constitute the onset of a syllable. Grammatical verb morphemes often do not fit syllable structure. For example, the syllable and morpheme boundaries never coincide in the following example: **Ø-in-is-on-og-o** 3SG-see-CAUS-ASS-PLUR-FV, [i.nì.sò.nò.gò] 'he will often appear'.⁷⁵ In all verb forms, a morpheme-final consonant syllabifies with a following vowel, either the final vowel or the vowel of a suffix or verb extension. All examples in this section are given with the class 9b prefix **ká-**, the final vowel **-a** of the Infinitive.⁷⁶

Examples of -CVC- verb roots include:

- (2.62) **ká-kúḁ-á**⁷⁷ [kákúḁá] '9b-hit-FV'
kó-muk-ó [kómùkó] '9b-pull out-FV'

Other common structures are -CVCVC-, -CV- and -CVCV-. In -CVCVC- verb roots, the vowels are identical in about two thirds of the roots, e.g.:

- (2.63) **ká-mbukúḁ-á** [ká^mbùkúḁá] '9b-dig using fingers-FV'
kó-pilíng-ó [kópilíⁿgó] '9b-twist-FV'

Longer structures do exist, but they involve one or more derivational suffixes, e.g. the Pluractional extension **-ag-** as in **-dingon-og-** [dìⁿgònòg] 'nid-nod', or the derivation **-man-** which conveys the idea of coming into a state and which is primarily attested in derivations from nominal modifiers or adjectives to verbs, e.g. **-kédě** [kédě] 'small', **-kíḁi-man-**⁷⁸ [kíḁimàn] 'become small'.

⁷⁵ **-in-** 'see', **-inis-** 'cause to see' ([+ATR] vowel harmony applied, changing the vowel of the verb root and the final vowel to a [+ATR] value), **-inison-** 'appear', **-inisonog-** 'appear repetitively'.

⁷⁶ The affix vowels assimilate to the [+ATR] value of the verb roots.

⁷⁷ The TAM melody of Infinitive is final-vowel High: a H tone on final vowel **-a**.

⁷⁸ The vowel of the verb root is high unrounded. Mid unrounded vowels do not occur in

As for -CV- and -CVCV- verb roots, the root-final vowel either merges with a following vowel or it is desyllabified, yielding the structure -(CV)CGV.

Examples of -CV- and -CVCV- verb roots (in Infinitive forms):

(2.64)		<u>root</u>		
	ká-kpă	/kpa/	[kákpă]	'9b-hit-FV'
	kó-my-õ	/mi/	[kómjõ]	'9b-pull out-FV'
	ká-kuly-á	/kult/	[kákùljá]	'9b-cut back-FV'
	kó-húkw-ó	/húku/	[kóhúkwó]	'9b-open-FV'

There are three -CVCVCV- verb roots in my data: **-gbukumi-** [gbùkùmì] 'lay down face downwards', **-gbukumi-** [gbùkùmì] 'brood' and **-kukumi-** [kùkùmì] 'hold tight'.⁷⁹

Relatively rare are verb roots with the structure -VC(VC)(VC)-, especially the longer forms. In some cases, the initial V-syllable is the (reflexive) prefix **ĩ-**, as in **ká-ig-á** [káìgá] '9b-bend-FV' or **ká-ib-ó**⁸⁰ [káìbó] '9b-know-FV'. Here are some examples of -VC- verb roots (in Infinitive forms):

(2.65)	ká-al-á	[káàlá]	'9b-chop, cleave-FV'
	ká-íkít-á	[káìkítá]	'9b-enter-FV'
	ká-ib-ó	[káìbó]	'9b-steal-FV'
	ká-ul-á	[káùlá]	'9b-break-FV'
	ká-up-ó	[káùpó]	'9b-rest-FV'

Verb roots with -VCVC(VC)- structure are rare. Examples include:

(2.66)	ká-ukán-á	[káùkáná]	'9b-hear-FV'
	ká-angány-á	[káà ^h gáɲá]	'9b-refuse-FV'
	ká-idúfúl-ó	[káìdúfúló]	'9b-try hard-FV'
	kó-uúbúkón-ó ⁸¹	[kóùbúkónó]	'9b-writhe-FV'

verb roots.

⁷⁹ I do not know whether it is a coincidence that they are quite similar.

⁸⁰ The [-ATR] vowel quality of the class 9b prefix shows the presence of the reflexive prefix, see 3.2.2.3.

⁸¹ These last two examples are the only -VCVCVC- verb roots in my data.

Verb roots with a V-syllable are also rare. Examples of -CVV-, -CVVC- and -CVVCV- structures include:⁸²

(2.67)	<u>root</u>		
ká-syé	/sú/	[kásjé]	'9b-follow:FV'
ká-saán-á	/saan/	[kásàáná]	'9b-quarrel-FV'
kó-ǂúúly-ó	/búuli/	[kóǂúúljó]	'9b-protect-FV'
kó-buúkón-ó	/buukon/	[kóǂùúkónó]	'9b-turn o.s. upside down, tumble town-FV'

2.5.3 Restrictions on consonants and vowels

Like many Bantu languages, Liko has restrictions on the (co)occurrence of consonants and vowels in words and affixes.

With respect to frequency of occurrence of vowels, the most frequent are the high and low vowels /i u a/, followed by the mid round vowel /o/. The [–ATR] mid vowels /ɛ ɔ/ occur less frequently. Least frequent is the mid unrounded vowel /e/.

a. Consonant constraints

As far as consonants are concerned, the distribution of /v, ^ɱv/ is generally limited to root-initial position, unless there is reduplication. The fricative /h/ occurs only in root-initial position. Labial-velar and prenasalized consonants do not occur in affixes. Apart from probably accidental gaps (i.e. in ideophones /m/ and /n/ are missing, in adverbs /h/ and /z/ do not occur, and there is no nominal modifier with an initial /n/ in my data), there are no distributional restrictions with respect to consonants, including prenasalized plosives⁸³.

b. Vowel constraints in nouns

In vowel-initial noun stems, every vowel occurs in initial position except the mid unrounded vowels /ɛ e/.

⁸² Apart from **ká-syé**, they probably contain a petrified extension.

⁸³ I mention prenasalized plosives because Hyman remarks (2003:50): "In PB, noun and verb roots did not begin with NC."

Table 6 shows the co-occurrences of vowels in disyllabic noun stems. An attempt has been made to exclude loanwords, derivations and reduplicated stems.⁸⁴

Table 6 Combinations of vowels in disyllabic noun stems

ɪ-ɪ	ndímu	'1a.animal, sp.'	i-i	li-tíndí	'5-heel'
ɪ-ɛ	mbíkɛ́	'9.clay pot'	i-e	li-tíke	'5-banana, sp.'
ɪ-a	li-píla	'5-guava'	i-a	mu-píla	'3-scarification'
ɪ-ɔ	píyɔ	'1a.viper'	i-o	li-píko	'5-side'
ɪ-u	-		i-u	-	
ɛ-ɪ	mu-nzekí	'1-termite, sp.'	e-i	nédí	'1a.small rat, sp.'
ɛ-ɛ	li-léke	'5-pelvis'	e-e	ngbezě	'1a.bird, sp.'
ɛ-a	-		e-a	-	
ɛ-ɔ	mébo	'1a.insect, sp.'	e-o	-	
ɛ-u	kpemú	'1a.hornbill'	e-u	dembú	'1a.mammal, sp.'
a-ɪ	li-bálí	'5-stomach'	a-i	ndáki	'1a.road'
a-ɛ	mu-bǎdɛ	'3-maize'	a-e	-	
a-a	mu-balá	'3-curse'	-		
a-ɔ	-		a-o	-	
a-u	bu-tambú	'14-shrub, sp.'	a-u	li-badú	'5-hole'
ɔ-ɪ	ngondí	'1a.crocodile'	o-i	mu-tónzi	'3-shrub, sp.'
ɔ-ɛ	-		o-e	koǎé	'9.cave'
ɔ-a	-		o-a	kpóya	'9.dance'
ɔ-ɔ	kpólɔ	'1a.side'	o-o	gbóngo	'1a.bird, sp.'
ɔ-u	mu-sɔpú	'3-intestine'	o-u	mboǎú	'1a.rodent, sp.'
u-ɪ	ndumbí	'9.fight'	u-i	mu-pumbí	'3-ladle'
u-ɛ	mu-nugbé	'1-caterpillar, sp.'	u-e	li-buté	'5-unripe fruit'

⁸⁴ Nouns with a vowel which is underlyingly different from its surface realization have not been included, i.e. **i-bikýá-su** [ɪbikjásù] '19-fury, madness-19', **i-dumá-su** [ɪdùmásù] '7-mourning-7', **(s)i-kú'bá-su** [ikú'básù] '19-chest-19', **ku-káká-ku** [kùkákákù] '15-housekeeping-15'. The underlying vowel in these roots is not /a/ but /o/.

u-a	kúgba	'1a.game bag'	u-a	ḍúnga	'9.winnowing basket'
u-ɔ	mú-dǔkpɔ	'3-walking stick'	u-o	mbúnzo	'9.fallow land'
u-u	lɪ-ngúku	'5-bald head'	u-u	gbulú	'9.vine, sp.'

General remarks

The gaps in Table 6 of vowel co-occurrences in disyllabic noun stems are to some extent related to the low frequency of /ɛ e/ and to the apparent preference in Liko for V_1 and V_2 to be either identical (about half of the disyllabic nouns) or to have a different value for [high]. Vowel-height dissimilation may be the reason behind the sparsity of examples in which one vowel is low and the other one is mid or when both are mid. There are no gaps when the vowels differ maximally in vowel height (high vs. low), or when one vowel is high and the other is mid.

high vowels: /ɪ-u/ and /i-u/

In underived disyllabic nouns, a high round vowel does not occur as V_2 if V_1 is high unrounded. This does not indicate a phonetic constraint, because there are many examples in which a high round vowel is preceded by a high unrounded vowel, e.g. **ɪ-gbǔ** [ɪgbǔ] '9a-small branch' and **i-ḍulú** [iḍulú] '1c-black snake, sp.'. Other examples are **bibú** [bìbú] '9.story', a nominalization from **-bib-** 'tell', or roots with a high round vowel, preceded by a modifier prefix with a high unrounded vowel, as **ḍi-ngbú** [ḍi^{nm}gbú] 'MOD, red', **ḍi-tú** [ḍítú] 'MOD, bright, white'.

mid vowels: /ɛ-ɔ/ and /e-o/, /ɔ-ɛ/ and /o-e/

Co-occurrence of mid vowels in a root is rare and for one of these combinations it is absent. If a combination does exist, there are only a few examples. The list is: for /ɛ-ɔ/, **méḍo** [méḍò] '1a.insect, sp.', **ku-ngbéko** [kù^{nm}gbékò] '15-tree, sp.' and **néko** [nékò] '1a.fetish'⁸⁵, for /ɔ-ɛ/, **ópé** [ópé] '1a.taboo food', **á-gómé** [ágómé] '1b-treaty', for /o-e/, **a-yómbé** [àyómbé] '1b-heron', **á-yopé** [ájòpé] '1b-land crab', **koḍé** [kòḍé] '9.cave' and **si-gogoḍé** [sìgògòḍé] 'sr:1-squirrel, bird, sp.'. The combination /e-o/ does not occur in roots, but only in cases with initial **nV-**, like **né-kokí** [nékòkí] 'na:1-bracelet'.

⁸⁵ **néko** is reported to be a loanword from Budu.

mid unrounded vowels and the low vowel: /a-ε/ and /a-e/, /ε-a/ and /e-a/

When a low vowel precedes a mid unrounded vowel, there is no restriction for the combination /a-ε/, e.g. **mu-bǎdɛ** [mùbǎdɛ] '3-maize', **í-mangé** [ímà^ɲgɛ́] '1c-starling'. For /a-e/ however, the only examples in my data are borrowings, e.g. **bu-sitaféli** [bùsitàfɛ̀li], '14-fruit tree, sp.'.

In disyllabic noun stems, a mid unrounded vowel is not followed by a low vowel. Nouns with initial **nV-** show that this is not a phonetic constraint, e.g. **négbǎ** [négbǎ] '1a.lizard' and **némbala** [né^mbàlǎ] '1a.tree, sp.'. ⁸⁶ In plural forms with prefix **ba-**, height coalescence of /a/ and /ɪ i/ to a mid vowel is not prevented by a constraint, as can be seen in the plural forms **bɛ-dǎ** [bɛdǎ] '2 + 9:9a-spot, stain', sg. **ɪ-dǎ** [ɪdǎ] '9a-spot, stain' and **bě-danga** [bɛdà^ɲgà] '2:1c-insect, sp.', sg. **í-danga** [ídà^ɲgà] '1c-insect, sp.'.

mid round vowels and the low vowel: /a-ɔ/ and /a-o/, /ɔ-a/ and /o-a/

Disyllabic nouns with an /a-ɔ/ or /a-o/ sequence are very rare. The only such noun stems attested are **mádɔ** [mádɔ] '1a.vine, sp.' and **madó** '1a.privateer'. A noun with initial **nV-** and /a-ɔ/ is **nǎ-fo** [nǎfò] 'na:1-fish, sp.'. The combination /a-ɔ/ does occur in trisyllabic nouns, e.g. **kaɓɔgɪ** [kàfògɪ] '1a.vine, sp.'.

Combinations of a [−ATR] mid round vowel /ɔ/ and the low vowel are absent in my data. ⁸⁷ For the [+ATR] mid round vowel /o/, there are only two examples, the one given in Table 6 and the other being **ndóya** [n^ɲdójà] '9.chicken pox'.

c. Vowel constraints in verbs

The great majority of -CVC- verb roots have vowels that are maximally distinct in terms of vowel height, i.e. either low or high, /a/ or /ɪ i ʊ u/. In disyllabic verb roots, the second vowel is always low or high.

⁸⁶ Both words are reported to be loanwords from Mangbetu.

⁸⁷ The only exception is a compound based on Swahili loanwords for a type of vine named 'to die (Congo Swahili **kufa**) and to get better (**kupona**)' (flowers droop when someone pulls at the vine and raise their leaves some time later) **kúfa-na-kupóna** [kúfànàkùpónà]. Congo Swahili /o/ is usually realized as /ɔ/ in Liko.

[+ATR] mid vowels occur only as V_1 in verb roots. The [+ATR] mid unrounded vowel /e/ occurs only in one verb root in my data, **-bedul-** [bèdùl] 'surpass'. The [+ATR] mid round vowel /o/ does occur, but not frequently, e.g. in -CVC- roots like **-bos-** [bòs] 'please' and **-kóng-** [kóŋg] 'roast', in the -CVCVC- roots **-sósuw-** [sósùw] 'yawn' and **-zotul-** [zòtùl] 'be surprised' and in the -CVCV- roots **-gbodi-** [gbòdì] 'coat' and **-tókú-** [tókú] 'chew'.

Surface [–ATR] mid vowels occur only in case of -CV- and -CVV- verb roots. Here is an exhaustive list of the Infinitive forms of the relevant verbs in my data:

(2.68)	surface		underlying	
a.	ká-tě	[kátě]	/tɪ-a/ ⁸⁸	'9b-put aside:FV'
b.	ká-ḡḡ	[káḡḡ]	/ḡu-a/	'9b-deceive:FV'
	ká-kó	[kákó]	/kú-a/	'9b-pick fruit/vegetables:FV'
	ká-kḡ	[kákḡ]	/ku-a/	'9b-cut:FV'
	ká-kpḡ	[kákpḡ]	/kpɔ-a/	'9b-dig:FV'
	ká-nyḡ	[kánpḡ]	/ɲu-a/	'9b-pull up, pull out:FV'
	ká-pḡ	[kápḡ]	/pu-a/	'9b-rot:FV'
	ká-sḡ	[kásḡ]	/su-a/	'9b-weed:FV'
c.	ká-ḡyě	[káḡjě]	/ḡu-a/	'9b-follow:FV'
	ká-pyě	[kápjě]	/pu-a/	'9b-burn:FV'
	ká-syé	[kásjě]	/sú-a/	'9b-pass (time), sleep:FV'
d.	ká-mwó	[kámwó]	/móu-a/	'9b-kill:FV'
	ká-wḡ	[káwḡ]	/wu-a/ ⁸⁹	'9b-row:FV'
e.	ká-dwě	[kádwe]	/duɪ-a/	'9b-arrive:FV'
	ká-ɪkwě	[káɪkwě]	/ɪkuɪ-a/	'9b-look:FV'

As shown in these examples, I have analysed these surface [–ATR] mid vowels as underlyingly high. The [+high, α round] vowel of the verb root and the [+low] verb-final vowel result in a vowel with features [–high, –low, α round]. Evidence

⁸⁸ The H tone on the final vowel of the Infinitive TAM melody becomes LH if a -CV- verb root has a primary L tone.

⁸⁹ Positing the underlying form as */wu-a/ would cause a problem with the constraint on /w/ followed by a high vowel in noun stems.

for positing an underlying high vowel comes from longer verb forms with inflectional or derivational suffixes with a high vowel. In (2.69a), the vowel of the verb root is followed by the Anterior aspect final vowel **-i**, in (2.69b, c) by the Causative extension **-is**, in (2.69d) by the Applicative extension **-ɪ** and in (2.69e) by the Subjunctive final vowel **-ɪ**. In (2.69f), the initial CV of the verb root is repeated (**-ɪu-** → **-ɪɪu-**) as can be seen in the Infinitive form **káɪɪɪyá** (***káɪɪɪyɛ**).

(2.69)	<u>surface</u>		<u>underlying</u>
a.	ḡáḡūni	[ḡáḡūnì]	/ḡá-ḡu- ^H i-ní/ ⁹⁰
	'they have deceived him'		3PL-1.O-deceive-FV.ANT-PFV
b.	kópusó	[kópùsó]	/ká-pu-is-á/
	'to cause to rot'		9b-rot-CAUS-FV
c.	udwiso	[ùdwìso]	/u-du-is-o/
	'he will let you arrive'		3SG:2SG.O-arrive-CAUS-FV
d.	íkpuɪyá	[íkpùɪjá]	/í-kpu-ɪɪ-á/
	'he dug for himself'		3SG ^P :REFL-dig-RES-APPL-FV ^P ⁹¹
e.	asyító na iḡúsú	[àsɟítò]	/a-sú-í-tɔ/
	'that he stay with us'		3SG-stay-FV.SUBJ-INS
f.	nɪɪɪya	[nòḡiḡjà]	/na-u-ɪɪɪ-a/ ⁹²
	'I follow you'		1SG:2SG.O-follow-FV

d. Consonant and vowel constraints in affixes

In prefixes, the consonant inventory is restricted to /b t k s m n l j w/. In suffixes only /t k g s m n l j/ occur. This means that voiced obstruents, labial-velar plosives, prenasalized consonants and fricatives except /s/ do not occur in prefixes. The same applies to suffixes, with the exception of /g/. In addition, implosives do not occur in suffixes.

⁹⁰ The H tone of the Perfective aspect suffix **-ní** is changed into a L tone if the final vowel **-i** of Anterior aspect is High.

⁹¹ Superscript "P" is used as notation for a High TAM tone which has a time reference to the past.

⁹² Reduplication, Infinitive **káɪyɛ** 'to follow'.

Affix vowels are underlyingly maximally distinct in terms of vowel height, i.e. either high /i u/ or low /a/. Mid vowels /ɛ e ɔ o/ do not occur as an underlying vowel in prefixes and suffixes.⁹³ Surface mid unrounded vowels are the result of height coalescence (see 3.3.2 and 3.3.3). The surface [+ATR] mid round vowel is an assimilated /a/ in a [+ATR] context.

Underlying /ɔ/ occurs in noun-class enclitics and in verbal enclitics, i.e. the Insistive enclitic **-tɔ** and the Supplicative enclitic **-nɔ**. The negative enclitic **-gu** has a high vowel.

⁹³ It would be unusual to have a suffix with a mid vowel, as suffixes in Bantu languages generally have either high or low vowels. Steriade 1995:156: "(...) mid vowels are underlyingly disallowed in Bantu suffixes, as well as most Bantu prefixes."

